



Docket No. 303.254US4
WD # 424943

Micron Ref. No. 96-0660.04

CLEAN VERSION OF PENDING CLAIMS

A SOLVENT PREWET AND METHOD TO DISPENSE THE SOLVENT PREWET

Applicant: John Whitman
Serial No.: 09/941,476

Claims 13-22, 24-29, 31-33, 35-39, 41, 42, 44-48, and 50-61, as of September 16, 2002
(Date of Response to Final Office Action).

13. (Amended) An apparatus, comprising:

Sub
D1
C2

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol and aliphatic ester, wherein a ratio of the diacetone alcohol and aliphatic ester ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

distributing the solvent on a wafer surface; and

upon distributing the solvent, distributing the photo resist solution on the wafer surface.

14. The apparatus of claim 13, wherein the solvent dispense head includes:

a first nozzle and a second nozzle in fluid communication with the source of photo resist solution; and

a third nozzle in fluid communication with the source of solvent.

15. The apparatus of claim 13, wherein, in the process performed by the logic control unit, distributing the solvent on the wafer surface comprises:

dispensing the solvent on the wafer surface; and

actuating the rotatable wafer-holding mechanism to spin the wafer until the prewet

solvent is distributed across the wafer surface.

16. The apparatus of claim 13, wherein, in the process performed by the logic control unit, distributing the photo resist solution on the wafer surface comprises:

dispensing the photo resist solution on the wafer; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

17. The apparatus of claim 13, wherein the process performed by the logic control unit further comprises dispensing the solvent for edge bead removal after distributing the photo resist solution on the wafer surface.

18. The apparatus of claim 13, wherein:

the photo resist solution comprises a resin, a photoactive compound and a photo resist solvent; and

the photo resist solvent contained within the photo resist solution includes the solvent from the solvent source.

19. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol and aliphatic ester, wherein a ratio of the diacetone alcohol and aliphatic ester ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface;

C2
control
Sub
DZ

actuating the rotatable wafer-holding mechanism to spin the wafer until the solvent is distributed across the wafer surface;
upon distributing the solvent, dispensing the photo resist solution on the wafer surface; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

20. The apparatus of claim 19, wherein:

the solvent dispense head includes a nozzle in fluid communication with the solvent source; and

in the process performed by the logic control unit, dispensing the solvent on a wafer surface includes dispensing the solvent from the nozzle.

21. The apparatus of claim 19, wherein:

the solvent dispense head includes:

a first nozzle in fluid communication with the source of photo resist solution;

a second nozzle in fluid communication with the source of photo resist solution;

and

a third nozzle in fluid communication with the solvent source; and

in the process performed by the logic control unit, dispensing the solvent on a wafer surface includes dispensing the solvent from the third nozzle, and dispensing the photo resist solution on the wafer surface includes dispensing the photo resist solution from the first nozzle and the second nozzle.

22. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone

cancel
Sub
D1

alcohol and aliphatic ester, wherein the solvent head includes:

a first nozzle directed at the edge and sides of the wafer;

a second nozzle directed at the back of the wafer; and

a third nozzle directed at the center of the wafer; and

a rotatable wafer-holding mechanism; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface, including dispensing the solvent from the third nozzle;

actuating the rotatable wafer-holding mechanism to spin the wafer until the solvent is distributed across the wafer surface;

upon distributing the solvent, dispensing the photo resist solution on the wafer surface;

upon distributing the photo resist material, dispensing the solvent from the first nozzle for edge bead removal and dispensing the solvent from the second nozzle for cleaning the back of the wafer; and

actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

24. (Amended) An apparatus, comprising:

a solvent dispense head in fluid communication with a source of a photo resist solution and further in fluid communication with a solvent source containing a solvent that includes diacetone alcohol, wherein the solvent dispense head includes:

a first nozzle in fluid communication with the source of the photo resist solution, the first nozzle being directed at a wafer edge and a wafer side;

a second nozzle in fluid communication with the source of the photo resist solution, the second nozzle being directed at a wafer back surface; and

a third nozzle in fluid communication with the solvent source, the third nozzle being directed at a center of a wafer top surface; and
a rotatable wafer-holding mechanism; and
a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:
distributing the solvent on a wafer surface using the third nozzle; and
upon distributing the solvent, distributing the photo resist solution on the wafer surface using the first and second nozzles.

25. The apparatus of claim 24, wherein:
the first nozzle and the second nozzle are in fluid communication with the solvent source;
and
the process executed by the logic control unit further comprises, upon distributing the photo resist solution, dispensing the solvent on the wafer using the first and second nozzles.

26. The apparatus of claim 24, wherein, in the process performed by the logic control unit, distributing the solvent on the wafer surface comprises:
dispensing the solvent on the wafer surface; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the prewet solvent is distributed across the wafer surface.

27. The apparatus of claim 24, wherein, in the process performed by the logic control unit, distributing the photo resist solution on the wafer surface comprises:
dispensing the photo resist solution on the wafer; and
actuating the rotatable wafer-holding mechanism to spin the wafer until the photo resist solution is distributed across the wafer surface.

5615
D2
C3
C41

28. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;

a solvent dispense head in fluid communication with a source of a photo resist solution and in fluid communication with a solvent source containing a solvent that includes diacetone alcohol, the solvent dispense head including:

a first nozzle in fluid communication with the source of the photo resist solution and directed at the top of the wafer;

a second nozzle in fluid communication with the source of the photo resist solution and directed at the back of the wafer; and

a third nozzle in fluid communication with the solvent source directed at the center of the wafer;

solenoids for controlling flow of the photo resist solution and the solvent through the solvent dispense head; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface;

spinning the wafer on the rotatable base until the solvent is distributed across the wafer surface;

dispensing the photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

29. The apparatus of claim 28, wherein:

the photo resist solution comprises a resin, a photoactive compound and a photo resist solvent; and

the photo resist solvent contained within the photo resist solution includes the solvent from the solvent source.

C3
copy
5/10/02

31. The apparatus of claim 28, wherein the process adapted to be executed by the logic control unit further includes dispensing solvent for edge bead removal after the photo resist solution is distributed across the wafer surface.

32. (Amended) An apparatus, comprising:

a rotatable base for holding a wafer;

a solvent dispense head, including:

a first nozzle in fluid communication with a source of a photo resist solution, wherein the first nozzle is directed at the edge and sides of the wafer and is in fluid communication with the solvent source;

a second nozzle in fluid communication with the source of the photo resist solution, wherein the second nozzle is directed at the back of the wafer and is in fluid communication with the solvent source; and

a third nozzle in fluid communication with a solvent source containing a solvent that includes diacetone alcohol;

solenoids for controlling flow through the first nozzle, the second nozzle and the third nozzle; and

a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the solvent on a wafer surface using the third nozzle;

spinning the wafer on the rotatable base until the solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer using the first nozzle and the second nozzle, including dispensing solvent through the first nozzle for edge bead removal, and dispensing solvent through the second nozzle on the back of the wafer to clean the wafer; and

Sub C
D3

C 4 sub D
contd spinning the wafer until the photo resist solution is distributed across the wafer surface.

33. The apparatus of claim 32, wherein the third nozzle is directed at the center of the wafer.

35. The apparatus of claim 32, wherein the source of photo resist solution includes a photo resist solvent, and wherein the source of the solvent and the photo resist solvent are from a common bulk solvent.

36. The apparatus of claim 32, wherein:
the photo resist solution comprises a resin, a photoactive compound and a photo resist solvent; and
the photo resist solvent contained within the photo resist solution includes the solvent from the solvent source.

37. (Amended) An apparatus, comprising:
a rotatable base for holding a wafer;
a solvent dispense head in fluid communication with a source of a photo resist solution and a bulk solvent that includes diacetone alcohol, wherein between 70% and 90% of the bulk solvent is diacetone alcohol;
solenoids for controlling flow of the photo resist solution and the bulk solvent through the solvent dispense head; and
a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:
dispensing the bulk solvent on a wafer surface;
spinning the wafer on the rotatable base until the bulk solvent is distributed across

the wafer surface;
dispensing the photo resist solution on the wafer; and
spinning the wafer until the photo resist solution is distributed across the wafer surface.

38. The apparatus of claim 37, wherein 70% of the bulk solvent is diacetone alcohol.

39. The apparatus of claim 37, wherein 90% of the bulk solvent is diacetone alcohol.

41. The apparatus of claim 37, wherein:
the photo resist solution comprises a resin, a photoactive compound and a photo resist solvent; and
the photo resist solvent contained within the photo resist solution includes the bulk solvent.

42. (Amended) An apparatus, comprising:
a rotatable base for holding a wafer;
a solvent dispense head in fluid communication with a source of a photo resist solution and a bulk solvent that includes a mixture of diacetone alcohol and aliphatic ester, wherein the mixture of diacetone alcohol and aliphatic ester includes a ratio that ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol;
solenoids for controlling flow of the photo resist solution and the bulk solvent through the solvent dispense head; and
a logic control unit coupled to the solenoids and adapted for executing a process to coat a wafer, wherein the process comprises:
dispensing the bulk solvent on a wafer surface;
spinning the wafer on the rotatable base until the bulk solvent is distributed across

C6
cont'd
sub D

the wafer surface;
dispensing the photo resist solution on the wafer; and
spinning the wafer until the photo resist solution is distributed across the wafer surface.

44. (Amended) A system for coating a wafer, comprising:

a bulk solvent container, wherein a bulk solvent contained therein includes aliphatic ester and diacetone alcohol mixed in a ratio that ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol;

/ a low pressure canister connected to the bulk solvent container; and

a track coating unit connected to the low pressure canister, the track coating unit comprising:

a solvent dispense head;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer; and

spinning the wafer until the photo resist solution is distributed across the wafer surface.

C
sub D

45. (Amended) The system of claim 44, wherein the bulk solvent further comprises aliphatic ester.

46. (Amended) The system of claim 44, wherein the solvent dispense head includes:
a first nozzle in fluid communication with the source of the photo resist solution and directed at the top of the wafer;
a second nozzle in fluid communication with the source of the photo resist solution and directed at the back of the wafer; and
a third nozzle in fluid communication with the solvent source directed at the center of the wafer.

47. (Amended) The system of claim 44, wherein the low pressure container is adapted to maintain a fluid pressure and a fluid level for the track coating unit.

48. (Amended) A system for coating a wafer, comprising:
a bulk solvent container, wherein a bulk solvent contained therein includes diacetone alcohol and aliphatic ester mixed in a ratio that ranges between 10% ester and 90% alcohol to 30% ester and 70% alcohol;

a low pressure canister connected to the bulk solvent container; and
a track coating unit connected to the low pressure canister, the track coating unit comprising:

a solvent dispense head;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface through a nozzle directed at a center of a wafer top surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer; and

Sub
D6
CH
contd

C7
cont'd sub D

spinning the wafer until the photo resist solution is distributed across the wafer surface.

50. (Amended) The system of claim 48, wherein the aliphatic ester and the diacetone alcohol are mixed in a ratio of 10% ester and 90% alcohol.

51. (Amended) The system of claim 48, wherein the aliphatic ester and the diacetone alcohol are mixed in a ratio of 30% ester and 70% alcohol.

52. (Amended) The system of claim 48, wherein the aliphatic ester is 10% of the bulk solvent.

53. (Amended) The system of claim 48, wherein the aliphatic ester is 30% of the bulk solvent.

54. (Amended) The system of claim 48, wherein the aliphatic ester is between 10% and 30% of the bulk solvent.

55. The system of claim 48, wherein the diacetone alcohol is 70% of the bulk solvent.

56. The system of claim 48, wherein the diacetone alcohol is 90% of the bulk solvent.

57. The system of claim 48, wherein the diacetone alcohol is between 70% and 90% of the bulk solvent.

58. (Amended) A system for coating a wafer, comprising:
a bulk solvent container, wherein a bulk solvent contained therein includes diacetone

alcohol; and

a track coating unit coupled to the bulk solvent container, the track coating unit comprising:

a solvent dispense head, including:

a first nozzle in fluid communication with the source of the photo resist solution and directed at the top edge and sides of the wafer for edge bead removal;

a second nozzle in fluid communication with the source of the photo resist solution and directed at the back of the wafer to clean the wafer; and

a third nozzle in fluid communication with the solvent source directed at the center of the wafer to prewet the wafer;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface using the third nozzle;

spinning the wafer on the rotatable base until the bulk solvent is

distributed across the wafer surface;

dispensing photo resist solution on the wafer;

spinning the wafer until the photo resist solution is distributed across the wafer surface; and

dispensing the bulk solvent on the edge and sides of the wafer using the first nozzle and on the back of the wafer using the second nozzle for edge bead removal and cleanup after distributing the photo resist.

sub
DIN

C 2

cont'd

59. The system of claim 58, wherein the solvent dispense head comprises nozzles, and the track coating unit further comprises solenoids coupled to the logic control unit for controlling the flow through the nozzles.

60. (Amended) The system of claim 58, wherein the bulk solvent further includes aliphatic ester.

61. (Amended) A system for coating a wafer, comprising:
a bulk solvent container, wherein a bulk solvent contained therein includes diacetone alcohol and aliphatic ester to form a mixture that has a ratio between 10% ester and 90% alcohol to 30% ester and 70% alcohol, and

a track coating unit coupled to the bulk solvent container, the track coating unit comprising:

a solvent dispense head;

a rotatable base for mounting the wafer; and

a logic control unit adapted for executing a process to coat a wafer, wherein the process comprises:

dispensing the bulk solvent on a wafer surface;

spinning the wafer on the rotatable base until the bulk solvent is distributed across the wafer surface;

dispensing photo resist solution on the wafer;

spinning the wafer until the photo resist solution is distributed across the wafer surface; and

dispensing the bulk solvent on the edge and sides of the wafer and on the back of the wafer for edge bead removal and cleanup after distributing the photo resist.